

MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4)  
COMBINED POLLUTANT REDUCTION PLAN (PRP)  
FOR  
SPRING TOWNSHIP

SPRING TOWNSHIP, BERKS COUNTY, PENNSYLVANIA

JULY 24, 2017

**MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4)  
COMBINED POLLUTANT REDUCTION PLAN (PRP)  
FOR  
SPRING TOWNSHIP**

**SPRING TOWNSHIP, BERKS COUNTY, PENNSYLVANIA**

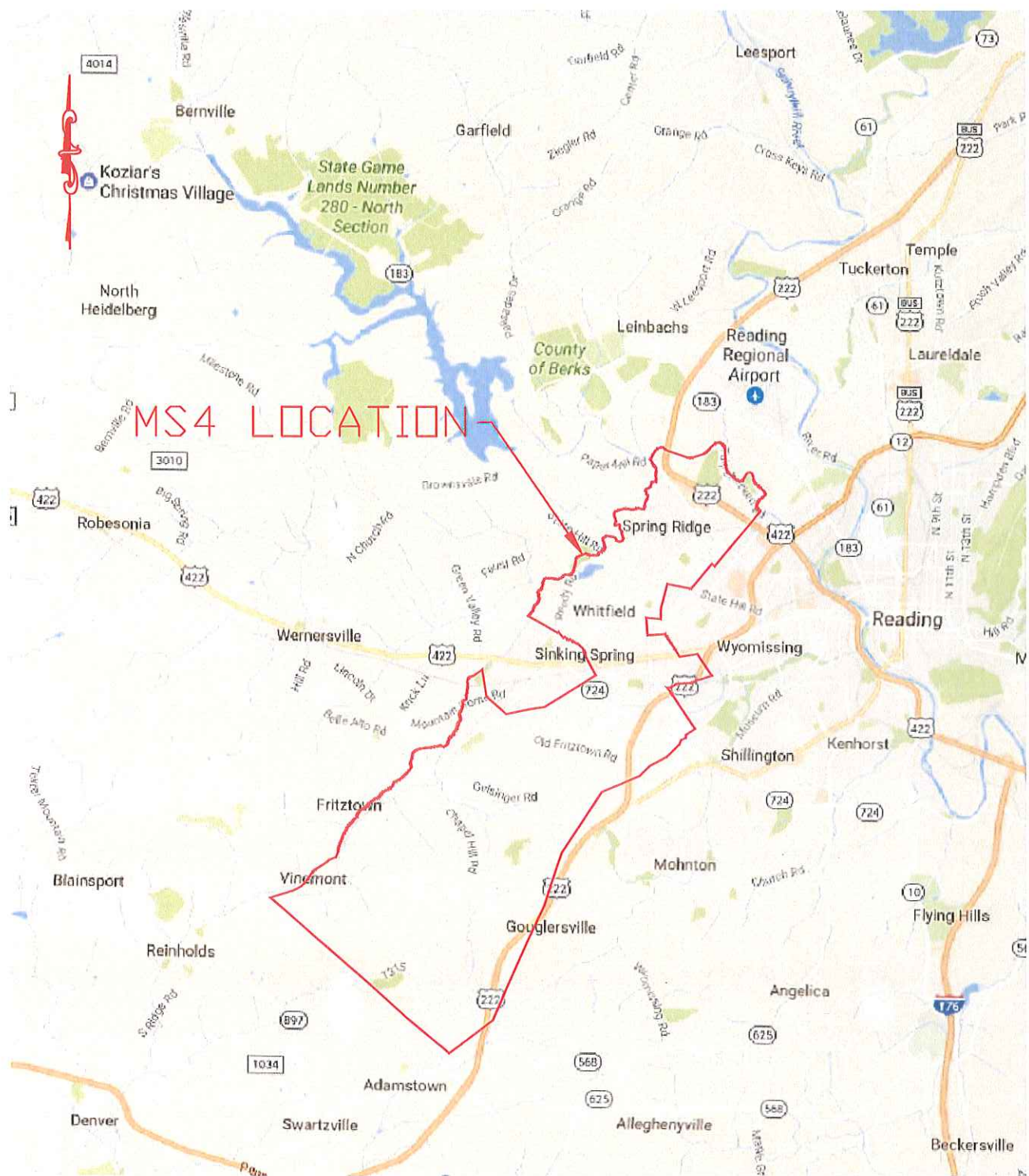
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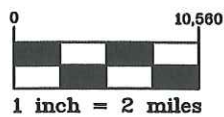
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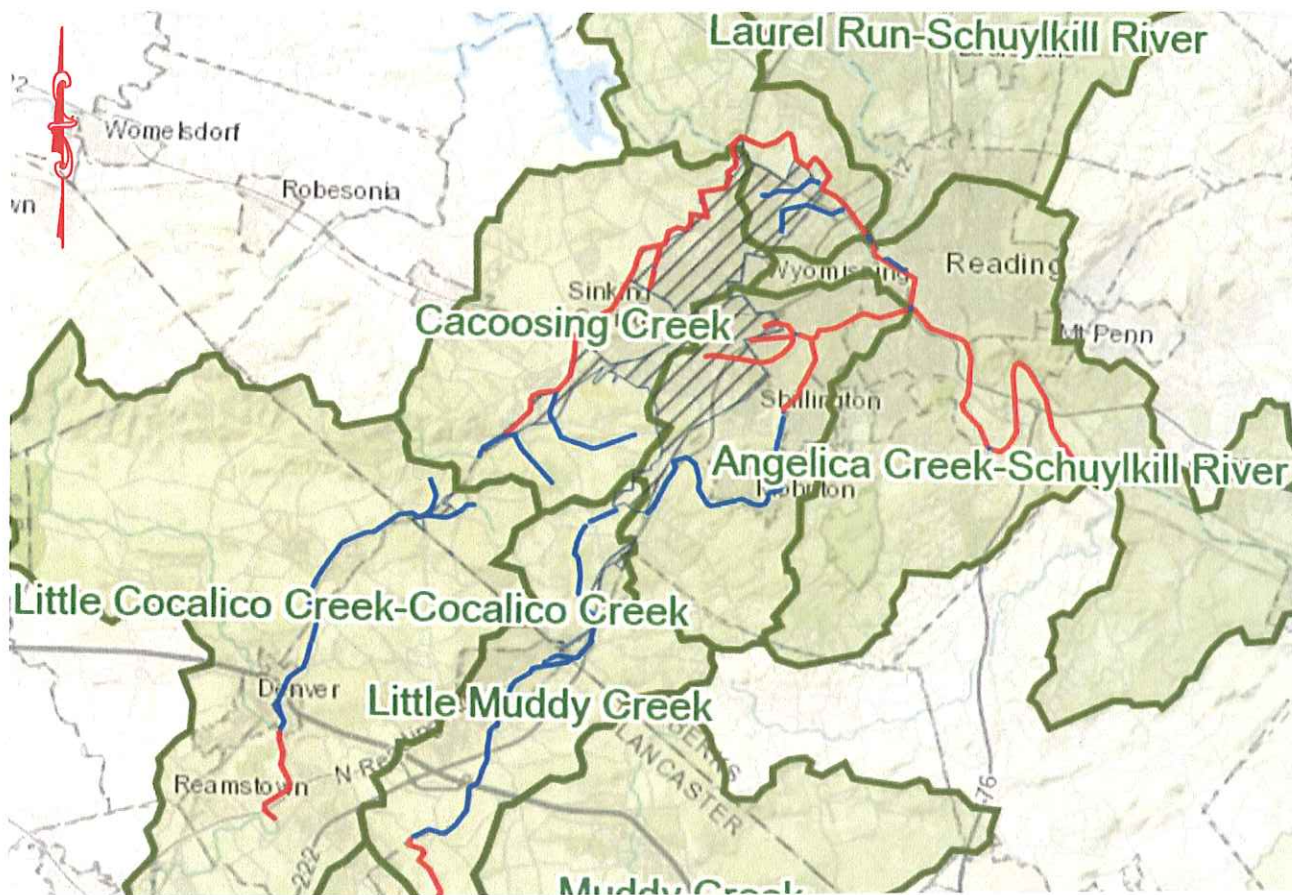


# GRAPHIC SCALE

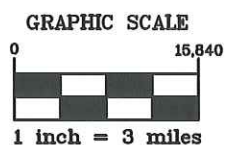


PROJECT: SPRING TOWNSHIP PRP  
 LOCATION MAP: SPRING TOWNSHIP, BERKS CO., PA  
 SCALE: 1" = 2 MILES  
 GVC FILE NO: 3011-413  
 DATE: JULY 21, 2017





MS4 Urban Area Report SPRING TWP, Berks County		
<b>INDIVIDUAL PERMIT REQUIRED:</b> Yes	<b>REASON:</b> TMDL Plan, SP, IP	<b>NPDES ID:</b> PAI133503
IMPAIRED DOWNSTREAM WATERS	REQUIREMENTS	OTHER CAUSES OF IMPAIRMENT
Wyomissing Creek TMDL	TMDL Plan-Siltation (4a)	Cause Unknown (4a)
Wyomissing Creek		Water/Flow Variability (4c)
Tulpehocken Creek	Appendix E-Nutrients (5)	
Schuylkill River	Appendix C-PCB (4a)	
Chesapeake Bay Nutrients/Sediment	Appendix D-Nutrients Siltation (4a)	
Little Muddy Creek	Appendix E-Siltation (5)	
Cocalico Creek	Appendix E-Nutrients Siltation (5)	Cause Unknown (5)
Cacoosing Creek	Appendix B-Pathogens (5) Appendix E-Nutrients Siltation (5)	



PROJECT: SPRING TOWNSHIP PRP  
 MS4 REQUIREMENTS MAP: SPRING TOWNSHIP  
 SCALE: 1" = 3 MILES  
 GVC FILE NO: 3011-413  
 DATE: JULY 21, 2017

**MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4)  
COMBINED POLLUTANT REDUCTION PLAN (PRP)  
FOR  
SPRING TOWNSHIP**

**SPRING TOWNSHIP, BERKS COUNTY, PENNSYLVANIA**

**Background**

Spring Township is a municipality located within south-central Berks County, approximately 4 miles west of the City of Reading. According to the 2010 U.S. Census, approximately 27,000 people reside within the Township. Of the Township's approximately 11,860 acres, 5,378 acres are located within the Urbanized Area as indicated on the maps prepared and issued by the U.S. Census Bureau.

The Township owns and is responsible for a number of different facilities within the Township. These facilities include: several parks, public streets, a municipal building, a police station, a library, a yard waste dump site, a public sanitary sewer system, a wastewater treatment plant and a storm sewer system. Approximately 2,660 acres of the Township drain to regulated (MS4) outfalls, outside of the Wyomissing Creek watershed, which are subject to PRP requirements. These regulated outfalls are located within three (3) separate, local, named watersheds: the Tulpehocken Creek, the Cacoosing Creek and the Little Muddy Creek. Since the Township storm sewer system operates within the regulated, urbanized area, the Township has been subject to the requirements of an MS4 Permit since 2003. Additionally, due to sediment, phosphorus and nitrogen impairments of the receiving streams to which the Township is tributary, as a condition of the 2018 MS4 Permit renewal, the Township is required to prepare and implement a Pollutant Reduction Plan (PRP) to reduce sediment, phosphorus and nitrogen loading from discharges associated with the Township's MS4. The PRP must be included with the Permit renewal package, due to the Department of Environmental Protection (DEP), Southcentral Region, no later than September 16, 2017. This PRP has been developed for the purpose of meeting the pollutant reduction requirements of the 2018 MS4 Permit. It is noted that this PRP addresses the pollutant reduction requirements of both the Chesapeake Bay watersheds and non-Chesapeake Bay watersheds.

**Watershed Information**

As noted above, the Township's MS4 drains to three (3) separate, local, named watersheds subject to PRP requirements. While a portion of the Township's MS4 drains to an additional watershed, the Wyomissing Creek, this PRP does not address the required pollutant reductions associated with the Wyomissing Creek impairment, as the Wyomissing Creek is subject to TMDL Implementation Plan requirements. A separate plan has been developed to address the required pollutant reductions associated with the Wyomissing Creek. It is noted that portions of the Township also drain to the Cocalico Creek; however, the Township does not own any regulated outfalls that located within the Cocalico Creek watershed portion of the Township.

Approximately 9.4% of the Township drains directly to the Tulpehocken Creek, which is tributary to the Schuylkill River. Eight (8) of the Township's regulated outfalls are located within the portion of the Township that drains directly to the Tulpehocken Creek. In total, approximately 50.9% of the Township drains to the Tulpehocken Creek.

Approximately 41.5% of the Township drains to the Cacoosing Creek. 27 of the Township's regulated outfalls are located within the Cacoosing Creek watershed. The Cacoosing Creek drains to the Tulpehocken Creek.

Approximately 18.1% of the Township drains the Wyomissing Creek which is a tributary of the Schuylkill River. While the Township does own regulated outfalls within the Wyomissing Creek watershed, this PRP does not address the required pollutant reductions associated with the Wyomissing Creek, as the watershed is subject to the requirements of a TMDL.

Approximately 12.1% of the Township drains to the Cocalico Creek watershed. There are no regulated outfalls located within the Cocalico Creek watershed portion of the Township. The Cocalico Creek is a tributary of the Conestoga River which ultimately drains to the Chesapeake Bay via the Susquehanna River.

Approximately 18.9% of the Township drains to the Little Muddy Creek watershed. There are six (6) regulated outfalls located within the Little Muddy Creek watershed portion of the Township. The Little Muddy Creek is a tributary of the Conestoga River which ultimately drains to the Chesapeake Bay via the Susquehanna River.

According to the municipal "MS4 Requirements Table (Appendix C-1)", as issued by DEP, each local watershed to which the Township MS4 drains is impaired due to one or more sources. The Tulpehocken Creek is currently impaired by nutrients. The Cacoosing Creek is currently impaired by nutrients, sediment and pathogens. The Little Muddy Creek is currently impaired by nutrients and sediment. The Wyomissing Creek is impaired by sediment and subject to a TMDL. The table also notes that the Schuylkill River is impaired by PCBs.

### **PRP Summary**

While the Township drains to four (4) separate local watersheds subject to the PRP requirements, the Township has elected to develop a combined PRP to address the required pollutant reductions associated with the watersheds located outside of the Wyomissing Creek watershed. The PRP has been developed in accordance with the "Pollutant Aggregation Suggestions for MS4 Requirements Table (Appendix E-2)," as issued by DEP. It is noted that the plan addresses only the required sediment and nutrient (phosphorus and nitrogen, as applicable) load reductions as separate Pollutant Control Measures (PCMs) will be developed and implemented during the next permit cycle to address the current pathogen and PCB impairments.

As noted above, 2,660 acres of the Township, outside of the Wyomissing Creek watershed, drain to outfalls subject to the PRP requirements. There are ten (10) separate areas within three (3) separate watersheds that drain to a total of 41 regulated outfalls. Ultimately, this Plan proposes

two (2) pollutant reduction BMPs to address the required pollutant reductions associated with the local watershed impairments. Proposed BMP-1 will be located on a Township owned property along the east side of Yerger Blvd., approximately 1,000' south of the intersection with State Hill Rd. Proposed BMP-2 will be located on a Township owned property along the north side of Goose Lane, immediately south of the Shiloh Hills Elementary School.

The following sections have been provided to address, in further detail, the specific PRP components. These components include: public participation, mapping, pollutants of concern, existing pollutant loading, proposed pollutant removal BMPs, anticipated costs & funding mechanisms and responsible parties for BMP operations & maintenance (O&M). It is noted that the following sections have been organized and formatted in accordance with the "Pollutant Reduction Plan (PRP) Instructions," as issued by DEP.

# **SECTION A**

## **Public Participation**



In accordance with the PRP Instructions, the Township has completed the following public participation measures listed below, and reported accordingly in the PRP that each measure was completed.

- The Township has made a complete copy of the PRP available for public review from August 1, 2017 to August 31, 2017.
- The Township has published, in the *Reading Eagle*, a public notice containing a statement describing the plan, where it was made available for review by the public, and the length of time the permittee provided for the receipt of comments. The public notice was published on August 1, 2017. A copy of the public notice has been included in Appendix A-1.
- The Township accepted written comments until August 31, 2017. A copy of all written comments that were received by the Township from the public has been included in Appendix A-2.
- The Township accepted comments from all interested members of the public at the August Township Supervisors meeting. A copy of the transcribed comments has been included in Appendix A-2.
- The Township has considered and made record of each timely comment received from the public during the public comment period concerning the plan. All comments received by the Township during the public comment period along with descriptions of all plan revisions that were made in response to the public comments have been provided in Appendix A-2.

# **SECTION A – Appendices**

Appendix A-1 – PRP Public Notice

Appendix A-2 – Public Comments/Responses

## Appendix A-1 – PRP Public Notice

## **APPENDIX A-1**

### **PUBLIC NOTICE**

#### **Spring Township Pollutant Reduction Plan (PRP)**

Notice is hereby given that Spring Township is making available, for public review, the draft Pollutant Reduction Plan (PRP), which is a required component of the Township's 2018 Municipal Separate Storm Sewer System (MS4) Permit. The Township is currently in the process of preparing the required permit renewal materials, including the PRP, which are due to the Department of Environmental Protection (DEP) no later than September 16, 2017. The plan addresses both the Chesapeake Bay PRP requirements and the PRP requirements associated with impaired streams located outside of the Chesapeake Bay watershed. The plan does not address the current impairment associated with the Wyomissing Creek, as a separate plan has been prepared to address the current impairment associated with the Wyomissing Creek.

Due to the sediment, phosphorus and nitrogen impairments of the local streams within the Township, the Township is required, by DEP under the 2018 Permit, to prepare and implement a PRP to reduce sediment, phosphorus and nitrogen loads, from the Township's storm sewer system, into the streams. The plan proposes the construction of a dry-extended detention basin within the Little Muddy Creek watershed to reduce the amount of sediment, phosphorus and nitrogen currently being discharged into the stream, which is located within the Chesapeake Bay watershed. The plan also proposes the construction of a wet pond within the Cacoosing Creek watershed to reduce the amount of sediment and phosphorus currently being discharged into the stream. Based on methodology developed by DEP, the facility within the Little Muddy Creek watershed has been designed and located to address the minimum required sediment, phosphorus and nitrogen load reductions of 10%, 5% and 3%, respectively, as stipulated by the Permit conditions. The facility within the Cacoosing Creek watershed has been designed and located to address the minimum required sediment and phosphorus load reductions of 10% and 5%, respectively, as stipulated by the Permit conditions.

The draft PRP will be available for public review and comment at the Spring Township Municipal Building, from 8:00 AM, August 1, 2017 to 5:00 PM, August 31, 2017. The Township Building is located at 2850 Windmill Rd., Sinking Spring, PA 19608. The Township's phone number is 610-678-5393. It is strongly encouraged that all comments regarding the PRP be provided to the Township in writing. Comments on the draft PRP will also be accepted at the Board of Supervisors meeting on August 14, 2017.

## Appendix A-2 – Public Comments/Responses

# **SECTION B**

## **PRP Mapping**



The required PRP Maps have been provided as a separate attachment to this PRP Narrative. The Township PRP consists of both the narrative and the maps. The following is a list of the maps that have been prepared to address the PRP mapping requirements along with a description of each map:

3011-413-D-000 (Title Sheet) – This sheet provides a regional location map along with a municipal scale watershed boundary map. The sheet also provides a sheet by sheet description for the entire mapping plan set.

3011-413-D-002 thru 005 (General Planning Area & Watershed Maps) – These sheets provide maps of the portions of the Township subject to the PRP requirements depicting topography, storm sewer facilities, MS4 outfalls, public streets, local watershed boundaries and urbanized area boundaries. Additionally, these sheets provide individual outfall drainage area boundaries and the PRP planning area boundaries.

3011-413-D-006 thru 009 (Pollutant Load & Parsing Plans) – In addition to the information provided on the General Planning Area Maps, these sheets delineate portions of the planning areas as non-urbanized, urbanized or parsed for the purposes of determining both existing pollutant loads and projected BMP pollutant loads. Additionally, separate insets are provided to depict the proposed structural BMP locations along with the tributary BMP drainage areas. These sheets also include existing pollutant load tables, proposed BMP pollutant load tables and projected BMP pollutant load removal tables.

# **SECTION C**

## **Pollutants of Concern**

As described in the background section of this narrative, the Township drains to five (5) separate, local, named watersheds. The following is a list of the impaired watersheds to which the MS4 is tributary along with descriptions of the pollutant reduction requirements to which the MS4 is subject:

Tulpehocken Creek - The Tulpehocken Creek is impaired by nutrients. The Tulpehocken Creek drains to the Schuylkill River which is impaired by PCBs. This PRP addresses the phosphorus component of the nutrient impairment associated with Tulpehocken Creek. As noted above, the PCB impairment associated with the Schuylkill River is not addressed by this PRP as the PCB impairment will be addressed under separate pollutant control measures (PCMs) during the next permit cycle.

Cacoosing Creek - The Cacoosing Creek is impaired by sediment, nutrients and pathogens. The Cacoosing Creek drains to the Tulpehocken Creek. This PRP addresses the sediment and phosphorus component of the nutrient impairment associated with the Cacoosing Creek. As noted above, the pathogen impairment is not addressed by this PRP as the pathogen impairment will be addressed under separate PCMs during the next permit cycle.

Wyomissing Creek - The Wyomissing Creek is impaired by sediment. Since the Wyomissing Creek watershed is subject to a TMDL, this PRP does not address the sediment impairment associated with the Wyomissing Creek as the sediment impairment is addressed under a separate TMDL Implementation Plan. The Wyomissing Creek drains to the Schuylkill River.

Tulpehocken Creek - The Tulpehocken Creek is impaired by nutrients. While no regulated outfalls discharge directly to the Tulpehocken Creek, regulated outfalls do exist upstream of the portion of the Tulpehocken Creek that abuts the northern municipal boundary. Therefore, the drainage areas associated with upstream regulated outfalls (within the Manor Creek, Spring Creek and Blue Marsh Lake watersheds) are subject to the PRP requirements associated with the Tulpehocken Creek.

Cocalico Creek - The Cocalico Creek is impaired by sediment and nutrients. However, since the Township owns no regulated outfalls within this watershed, no pollutant reductions within the Cocalico Creek are required. The Cocalico Creek drains to the Conestoga River which drains to the Susquehanna River. The Cocalico Creek ultimately drains to the Chesapeake Bay.

Little Muddy Creek - The Little Muddy Creek is impaired by sediment and nutrients. The Little Muddy Creek drains to the Conestoga River which drains to the Susquehanna River. The Little Muddy Creek ultimately drains to the Chesapeake Bay. This PRP addresses the sediment and nutrient (phosphorus and nitrogen) impairments associated with the Little Muddy Creek.

All MS4 drainage areas, with the exception of those located within the Wyomissing Creek watershed, are subject to nutrient reduction requirements. All MS4 drainage areas, with the exception of those that drain directly to the Tulpehocken Creek, are subject to sediment reduction requirements; however, as noted above, the required sediment reduction associated with the Wyomissing Creek is addressed by a separate TMDL Implementation Plan. To simplify the

calculations and plan development, it was assumed that the entire MS4 drainage area, located outside of the Wyomissing Creek watershed, is subject to the sediment reduction requirements.

As noted in the background section of this narrative, only the required sediment and nutrient reductions are addressed by this PRP as separate Pollutant Control Measures (PCMs) will be developed and implemented during the next permit cycle to address the current pathogen and PCB impairments. To meet the required pollutant load reductions, the Township will need to reduce the existing MS4 sediment loading by a least 10% and reduce the existing MS4 phosphorus loading by at least 5%. Additionally, for those MS4 drainage areas located within the Chesapeake Bay watershed (the Little Muddy Creek), the required minimum 3% nitrogen load reduction has been addressed.

See Appendix C-1 for an excerpt of the municipal "MS4 Requirements Table" pertaining to the Township.

## **SECTION C – Appendices**

### Appendix C-1 – MS4 Requirements Table Excerpt

# APPENDIX C-1

MS4 Name	NPDES ID	Individual Permit Required?	Reason	Impaired Downstream Waters or Applicable TMDL Name	Requirement(s)	Other Cause(s) of Impairment
<b>Berks County</b>						
SINKING SPRING BORO	PAG133509	No		Cacoosing Creek	Appendix B-Pathogens (5), Appendix E-Nutrients, Siltation (5)	
				Schuylkill River	Appendix C-PCB (4a)	
				Tulpehocken Creek	Appendix E-Nutrients (5)	
SOUTH HEIDELBERG TWP	PAG133709	No		Cocalico Creek	Appendix E-Nutrients, Siltation (5)	Cause Unknown (5)
				Tulpehocken Creek	Appendix E-Nutrients (5)	
				Blue Marsh Lake	Appendix B-Pathogens (5)	
				Schuylkill River	Appendix C-PCB (4a)	
				Cacoosing Creek	Appendix B-Pathogens (5), Appendix E-Nutrients, Siltation (5)	
				Manor Creek	Appendix E-Nutrients, Siltation (4a)	
				Little Cacoosing Creek	Appendix E-Nutrients, Siltation (4a)	
				Chesapeake Bay Nutrients/Sediment	Appendix D-Nutrients, Siltation (4a)	
SPRING TWP	PAI133503	Yes	TMDL Plan, SP, IP	Spring Creek	Appendix E-Nutrients, Siltation (5)	
				Wyomissing Creek		Water/Flow Variability (4c)
				Little Muddy Creek	Appendix E-Siltation (5)	
				Cocalico Creek	Appendix E-Nutrients, Siltation (5)	Cause Unknown (5)
				Cacoosing Creek	Appendix B-Pathogens (5), Appendix E-Nutrients, Siltation (5)	
				Chesapeake Bay Nutrients/Sediment	Appendix D-Nutrients, Siltation (4a)	
				Tulpehocken Creek	Appendix E-Nutrients (5)	
				Wyomissing Creek TMDL	TMDL Plan-Siltation (4a)	Cause Unknown (4a)
ST LAWRENCE BORO	PAG133508	No		Schuylkill River	Appendix C-PCB (4a)	
				Anlietam Creek	Appendix B-Pathogens (5)	
TILDEN TWP		No		Schuylkill River PCB TMDL	Appendix C-PCB (4a)	
				Mill Creek	Appendix B-Pathogens (5)	
				Schuylkill River	Appendix C-PCB (4a)	
TOPTON BORO		Yes	SP	Hassler Run	Appendix B-Pathogens (5)	
				Little Lehigh Creek	Appendix B-Pathogens (5), Appendix E-Siltation (5)	
				Unnamed Tributaries to Little Lehigh Creek	Appendix E-Organic Enrichment/Low D.O. (5)	Cause Unknown (5), Other Habitat Alterations, Water/Flow Variability (4c)
TULPEHOCKEN TWP		No		Chesapeake Bay Nutrients/Sediment	Appendix D-Nutrients, Siltation (4a)	
				Little Swatara Creek	Appendix B-Pathogens (5)	
				Unnamed Tributaries to Little Swatara Creek	Appendix E-Nutrients, Organic Enrichment/Low D.O., Siltation (4a)	
UNION TWP	PAG133528	No		Schuylkill River PCB TMDL	Appendix C-PCB (4a)	



# **SECTION D**

## **Existing Pollutant Loading**

The Township has elected to use DEP's "simplified method" for PRP development. This method assigns pollutant loading rates to areas based on land coverages. The method considers only two types of land coverages: pervious and impervious. The method allows these coverages to be estimated on a municipal basis in accordance with the "Statewide MS4 Land Cover Estimates" document (see Appendix D-1) as issued by DEP. The pervious and impervious pollutant loading rates for the pollutants of concern, sediment and phosphorus, are based on "Attachment B" of the PRP instructions (see Appendix D-2).

Based on the "Statewide MS4 Land Cover Estimates" document, 41% of the urbanized area within the Township is impervious (59% pervious), and 21% of the non-urbanized area is impervious (79% pervious). Based on "Attachment B" of the PRP instructions, the sediment loading rate for impervious areas located within the Township (Berks County) is 1,925.79 lbs/yr while the loading rate for pervious areas is 264.29 lbs/yr. The phosphorus loading rate for impervious areas is 2.26 lbs/yr while the loading rate for pervious areas is 0.98 lbs/yr. The nitrogen loading rate for impervious areas is 36.81 lbs/yr while the loading rate for pervious areas is 34.02 lbs/yr. It is noted that these rates were established for areas of Berks County located within the Chesapeake Bay watershed, which some portions of the Township is not. For municipalities and areas of the state located outside of the Chesapeake Bay, "Attachment B" provides separate pollutant loading rates that were established "for all other counties" by simply calculating the average pollutant loading rates of all the counties within the Chesapeake Bay watershed. Since the rates assigned to areas of Berks County located within the Chesapeake Bay watershed are likely more representative than those derived based on averages across the state, the existing pollutant loads for all MS4 drainage areas, even those located outside of the Chesapeake Bay watershed, have been calculated using the rates established for those areas of Berks County located within the Chesapeake Bay watershed.

In accordance with the "simplified method" procedures, certain areas were "parsed" from the pollutant loading calculations. The areas that were parsed are limited to those areas located within PennDOT road right-of-ways. All areas that have been parsed from the pollutant loading calculations have been identified on the PRP maps. It is noted that all areas that were parsed for the purposes of the existing pollutant loading calculations were also parsed for the purposes of proposed BMP pollutant loading calculations, as applicable. It is further noted that the Township has elected to not "claim credit" for any previously installed stormwater management BMPs.

The existing pollutant loads were calculated for each municipal MS4 outfall and then added together to determine the total sediment and phosphorus pollutant loads for the entire planning area. In accordance with the "Pollutant Aggregation Suggestions for MS4 Requirements Table," the required pollutant reductions were determined for the Tulpehocken Creek and Cacoosing Creek watersheds as a total rather than individually. The required pollutant load reductions associated with the Little Muddy Creek were determined separately. The total existing sediment loads were then multiplied by a factor of 0.10 to determine the minimum required sediment load reductions while the total existing phosphorus loads were multiplied by a factor of 0.05 to determine the minimum required phosphorus load reductions. For the MS4 drainage areas located within the Little Muddy Creek watershed, the total existing nitrogen load was multiplied by a factor of 0.03 to determine the minimum required nitrogen load reduction.

Existing pollutant loading calculations have been provided in Appendix D-3 and Appendix D-4. Additionally, summary tables of the existing pollutant load calculations has been provided on sheets 3011-413-D-008 & 009 of the mapping plan set.

The existing loading calculations were prepared on July 24, 2017.

## **SECTION D – Appendices**

Appendix D-1 – Statewide MS4 Land Cover Estimates

Appendix D-2 – Attachment B (from PRP Instructions)

Appendix D-3 – Pollutant Load Calculations –  
Tulpehocken Creek & Cacoosing Creek

Appendix D-4 – Pollutant Load Calculations – Little  
Muddy Creek

# APPENDIX D-1

## Statewide MS4 Land Cover Estimates

County	Municipality	UA % Impervious	UA % Pervious	Outside of UA % Impervious	Outside of UA % Pervious	UA Acres
Lehigh	SOUTH WHITEHALL TWP	39%	61%	27%	73%	7,076.8
Lycoming	SOUTH WILLIAMSPORT BORO	41%	59%	41%	59%	1,359.2
Washington	SPEERS BORO	31%	69%	31%	69%	647.0
Berks	SPRING TWP	41%	59%	21%	79%	5,391.7
Centre	SPRING TWP	34%	66%	8%	92%	797.4
Chester	SPRING CITY BORO	41%	59%	40%	60%	512.8
Allegheny	SPRINGDALE BORO	49%	51%	44%	56%	596.5
Allegheny	SPRINGDALE TWP	14%	86%	14%	86%	1,527.6
York	SPRINGGETTSBURY TWP	37%	63%	34%	66%	9,473.5
Bucks	SPRINGFIELD TWP	14%	86%	4%	96%	978.5
Delaware	SPRINGFIELD TWP	42%	58%	42%	58%	4,035.9
Montgomery	SPRINGFIELD TWP	41%	59%	41%	59%	4,340.8
York	SPRINGFIELD TWP	16%	84%	6%	94%	854.0
York	SPRING GARDEN TWP	41%	59%	40%	60%	4,195.5
York	SPRING GROVE BORO	44%	56%	42%	58%	447.6
Centre	STATE COLLEGE BORO	57%	43%	57%	43%	2,924.7
Dauphin	STEELTON BORO	45%	55%	45%	55%	1,191.8
Washington	STOCKDALE BORO	44%	56%	24%	76%	82.7
Northampton	STOCKERTOWN BORO	37%	63%	37%	63%	631.2
Cambria	STONYCREEK TWP	23%	77%	17%	83%	1,396.6
Allegheny	STOWE TWP	40%	60%	39%	61%	1,463.2
Adams	STRABAN TWP	25%	75%	7%	93%	1,194.2
Lancaster	STRASBURG BORO	40%	60%	39%	61%	600.9
Lancaster	STRASBURG TWP	8%	92%	6%	94%	2,014.8
Monroe	STROUD TWP	18%	82%	12%	88%	12,314.7
Monroe	STROUDSBURG BORO	49%	51%	49%	51%	1,103.9
Luzerne	SUGARLOAF TWP	32%	68%	6%	94%	728.3
Luzerne	SUGAR NOTCH BORO	19%	81%	19%	81%	642.9
Erie	SUMMIT TWP	24%	76%	12%	88%	5,775.6
Dauphin	SUSQUEHANNA TWP	28%	72%	28%	72%	9,482.8
Lycoming	SUSQUEHANNA TWP	31%	69%	4%	96%	384.7
Westmoreland	SUTERSVILLE BORO	24%	76%	24%	76%	173.8
Delaware	SWARTHMORE BORO	23%	77%	23%	77%	898.7
Dauphin	SWATARA TWP	37%	63%	31%	69%	8,184.1
Lebanon	SWATARA TWP	9%	91%	4%	96%	2,592.7
Allegheny	SWISSVALE BORO	56%	44%	56%	44%	794.9
Luzerne	SWOYERSVILLE BORO	40%	60%	38%	62%	1,361.4
Allegheny	TARENTUM BORO	34%	66%	34%	66%	884.7
Northampton	TATAMY BORO	29%	71%	29%	71%	335.4
Lackawanna	TAYLOR BORO	31%	69%	26%	74%	2,476.8
Montgomery	TELFORD BORO	50%	50%	50%	50%	656.5
Lancaster	TERRE HILL BORO	40%	60%	40%	60%	291.9
Allegheny	THORNBURG BORO	23%	77%	23%	77%	281.2
Chester	THORNBURY TWP	16%	84%	16%	84%	2,468.0
Delaware	THORNBURY TWP	12%	88%	12%	88%	5,334.6
Lackawanna	THROOP BORO	40%	60%	21%	79%	1,464.4
Berks	TILDEN TWP	22%	78%	6%	94%	1,827.3
Delaware	TINICUM TWP	41%	59%	30%	70%	3,679.3
Berks	TOPTON BORO	47%	53%	46%	54%	423.7
Montgomery	TOWAMENCIN TWP	39%	61%	34%	66%	5,298.7
Westmoreland	TRAFFORD BORO	24%	76%	24%	76%	907.2
Delaware	TRAINER BORO	58%	42%	51%	49%	677.8
Montgomery	TRAPPE BORO	32%	68%	32%	68%	1,367.0



# APPENDIX D-2

## ATTACHMENT B

### DEVELOPED LAND LOADING RATES FOR PA COUNTIES<sup>1,2,3</sup>

County	Category	Acres	TN lbs/acre/yr	TP lbs/acre/yr	TSS (Sediment) lbs/acre/yr
Adams	impervious developed	10,373.2	33.43	2.1	1,398.77
	pervious developed	44,028.6	22.99	0.8	207.67
Bedford	impervious developed	9,815.2	19.42	1.9	2,034.34
	pervious developed	19,425	17.97	0.68	301.22
Berk	impervious developed	1,292.4	36.81	2.26	1,925.79
	pervious developed	5,178.8	34.02	0.98	264.29
Blair	impervious developed	3,587.9	20.88	1.73	1,813.55
	pervious developed	9,177.5	18.9	0.62	267.34
Bradford	impervious developed	10,423	14.82	2.37	1,880.87
	pervious developed	23,709.7	13.05	0.85	272.25
Cambria	impervious developed	3,237.9	20.91	2.9	2,155.29
	pervious developed	8,455.4	19.86	1.12	325.3
Cameron	impervious developed	1,743.2	18.46	2.98	2,574.49
	pervious developed	1,334.5	19.41	1.21	379.36
Carbon	impervious developed	25.1	28.61	3.97	2,177.04
	pervious developed	54.2	30.37	2.04	323.36
Centre	impervious developed	7,828.2	19.21	2.32	1,771.63
	pervious developed	15,037.1	18.52	0.61	215.84
Chester	impervious developed	1,838.4	21.15	1.46	1,504.78
	pervious developed	10,439.8	14.09	0.36	185.12
Clearfield	impervious developed	9,638.5	17.54	2.78	1,902.9
	pervious developed	17,444.3	18.89	1.05	266.62
Clinton	impervious developed	7,238.5	18.02	2.80	1,856.91
	pervious developed	11,153.8	16.88	0.92	275.81
Columbia	impervious developed	7,343.1	21.21	3.08	1,929.18
	pervious developed	21,848.2	22.15	1.22	280.39
Cumberland	impervious developed	8,774.8	28.93	1.11	2,065.1
	pervious developed	26,908.6	23.29	0.34	306.95
Dauphin	impervious developed	3,482.4	28.59	1.07	1,999.14
	pervious developed	9,405.8	21.24	0.34	299.62
Elks	impervious developed	1,317.7	18.91	2.91	1,556.93
	pervious developed	1,250.1	19.32	1.19	239.85
Franklin	impervious developed	13,832.3	31.6	2.72	1,944.85
	pervious developed	49,908.6	24.37	0.76	308.31
Fulton	impervious developed	3,712.9	22.28	2.41	1,586.75
	pervious developed	4,462.3	18.75	0.91	236.54
Huntington	impervious developed	7,321.9	18.58	1.63	1,647.53
	pervious developed	11,375.4	17.8	0.61	260.15
Indiana	impervious developed	589	19.29	2.79	1,621.25
	pervious developed	972	20.1	1.16	220.68
Jefferson	impervious developed	21.4	18.07	2.76	1,369.63
	pervious developed	20.4	19.96	1.24	198.60
Juniata	impervious developed	3,770.2	22.58	1.69	1,903.96
	pervious developed	8,928.3	17.84	0.55	260.68
Lackawana	impervious developed	2,969.7	19.89	2.84	1,305.05
	pervious developed	7,783.9	17.51	0.76	132.98
Lancaster	impervious developed	4,918.7	38.53	1.55	1,480.43
	pervious developed	21,649.7	22.24	0.36	190.93
Lebanon	impervious developed	1,192.1	40.58	1.85	1,948.53
	pervious developed	5,150	27.11	0.4	269.81
Luzerne	impervious developed	5,857	20.43	3	1,648.22
	pervious developed	13,482.9	19.46	0.98	221.19
Lycoming	impervious developed	10,031.7	16.48	2.57	1,989.64
	pervious developed	19,995.5	16	0.84	277.38



## POLLUTANT REDUCTION PLAN CALCULATIONS

GVC File No. 3011-413

Date: July 24, 2017

UA ID: Reading - 73,693

Existing Study Area Cover Calculations																Existing Sediment Load Calculations					Existing Phosphorus Load Calculations				
Outfall ID	Outfall Drainage Area (acres)	Parsed Areas (acres)		UA Drainage Area (acres)	Non-UA Drainage Area (acres)	Impervious Area Factor (UA)	UA Impervious Area (acres)	Impervious Area Factor (Non-UA)	Non-UA Impervious Area (acres)	Pervious Area Factor (UA)	UA Pervious Area (acres)	Pervious Area Factor (Non-UA)	Non-UA Pervious Area (acres)	Total Impervious Area (acres)	Total Pervious Area (acre)	Impervious Area Sediment Load Factor (lbs/acre/yr)	Pervious Area Sediment Load Factor (lbs/acre/yr)	Impervious Area Sediment Load (lbs/yr)	Pervious Area Sediment Load (lbs/yr)	Total Outfall Sediment Load (lbs/yr)	Impervious Area Phosphorus Load Factor (lbs/acre/yr)	Pervious Area Phosphorus Load Factor (lbs/acre/yr)	Impervious Area Phosphorus Load (lbs/yr)	Pervious Area Phosphorus Load (lbs/yr)	Total Outfall Phosphorus Load (lbs/yr)
		PennDOT	Other																						
101	72.45	3.18	0.00	0.38	68.89	0.41	0.16	0.21	14.47	0.59	0.23	0.79	54.42	14.62	54.64	1925.79	264.29	28159.84	14442.10	42601.94	2.26	0.98	33.05	53.55	86.60
102	50.21	5.10	0.00	38.75	6.36	0.41	15.89	0.21	1.34	0.59	22.86	0.79	5.02	17.22	27.89	1925.79	264.29	33166.41	7369.80	40536.21	2.26	0.98	38.92	27.33	66.25
103	46.06	3.54	0.00	42.52	0.00	0.41	17.43	0.21	0.00	0.59	25.09	0.79	0.00	17.43	25.09	1925.79	264.29	33574.12	6630.48	40204.60	2.26	0.98	39.40	24.59	63.99
104	12.41	0.00	0.00	12.41	0.00	0.41	5.09	0.21	0.00	0.59	7.32	0.79	0.00	5.09	7.32	1925.79	264.29	9796.86	1934.76	11731.62	2.26	0.98	11.50	7.17	18.67
105	17.60	1.57	0.00	16.03	0.00	0.41	6.57	0.21	0.00	0.59	9.46	0.79	0.00	6.57	9.46	1925.79	264.29	12659.47	2500.09	15159.56	2.26	0.98	14.86	9.27	24.13
106	204.64	12.56	0.00	192.09	0.00	0.41	78.76	0.21	0.00	0.59	113.33	0.79	0.00	78.76	113.33	1925.79	264.29	151666.60	29952.28	181618.89	2.26	0.98	177.99	111.06	289.05
107	237.03	4.36	0.00	232.66	0.00	0.41	95.39	0.21	0.00	0.59	137.27	0.79	0.00	95.39	137.27	1925.79	264.29	183705.66	36279.60	219985.26	2.26	0.98	215.59	134.53	350.11
108	46.48	1.17	0.00	45.31	0.00	0.41	18.58	0.21	0.00	0.59	26.73	0.79	0.00	18.58	26.73	1925.79	264.29	35775.73	7065.26	42840.99	2.26	0.98	41.98	16.20	68.18
201	4.05	0.00	0.00	4.05	0.00	0.41	1.66	0.21	0.00	0.59	2.39	0.79	0.00	1.66	2.39	1925.79	264.29	3198.73	631.71	3830.44	2.26	0.98	3.75	2.34	6.10
202	24.32	0.00	0.00	24.32	0.00	0.41	9.97	0.21	0.00	0.59	14.35	0.79	0.00	9.97	14.35	1925.79	264.29	19200.15	3791.79	22991.95	2.26	0.98	22.53	14.06	36.59
203	34.61	0.75	0.00	3.22	30.64	0.41	1.32	0.21	6.43	0.59	1.90	0.79	24.20	7.76	26.11	1925.79	264.29	14936.73	6899.82	21836.55	2.26	0.98	17.53	25.58	43.11
204	0.35	0.01	0.00	0.34	0.00	0.41	0.14	0.21	0.00	0.59	0.20	0.79	0.00	0.14	0.20	1925.79	264.29	265.05	52.34	317.40	2.26	0.98	0.31	0.19	0.51
205	27.33	0.07	0.00	17.76	9.50	0.41	7.28	0.21	2.00	0.59	10.48	0.79	7.51	9.28	17.98	1925.79	264.29	17864.03	4752.73	22616.76	2.26	0.98	20.96	17.62	38.59
206	8.96	1.22	0.00	7.73	0.00	0.41	3.17	0.21	0.00	0.59	4.56	0.79	0.00	3.17	4.56	1925.79	264.29	6104.71	1205.60	7310.31	2.26	0.98	7.16	4.47	11.63
207	7.11	0.00	0.00	7.11	0.00	0.41	2.92	0.21	0.00	0.59	4.20	0.79	0.00	2.92	4.20	1925.79	264.29	5615.95	1109.08	6725.03	2.26	0.98	6.59	4.11	10.70
208	2.31	0.00	0.00	2.31	0.00	0.41	0.95	0.21	0.00	0.59	1.37	0.79	0.00	0.95	1.37	1925.79	264.29	1827.52	360.91	2188.44	2.26	0.98	2.14	1.34	3.48
209	40.72	1.36	0.00	15.60	23.76	0.41	6.40	0.21	4.99	0.59	9.21	0.79	18.77	11.39	27.97	1925.79	264.29	21927.27	7393.41	29320.68	2.26	0.98	25.73	27.42	53.15
210	47.42	0.63	0.00	14.34	32.46	0.41	5.88	0.21	6.82	0.59	8.46	0.79	25.64	12.69	34.10	1925.79	264.29	24444.79	9011.82	33456.61	2.26	0.98	28.69	33.42	62.10
211	44.73	0.01	0.00	8.42	36.29	0.41	3.45	0.21	7.62	0.59	4.97	0.79	28.67	11.07	33.64	1925.79	264.29	21325.96	8890.12	30216.08	2.26	0.98	25.03	32.96	57.99
212	37.38	0.00	0.00	0.25	37.13	0.41	0.10	0.21	7.80	0.59	0.15	0.79	29.33	7.90	29.48	1925.79	264.29	15216.47	7791.81	23008.28	2.26	0.98	17.86	28.89	46.75
213	225.06	0.00	0.00	103.54	121.53	0.41	42.45	0.21	25.52	0.59	61.09	0.79	96.01	67.97	157.09	1925.79	264.29	130896.35	41517.71	172414.06	2.26	0.98	153.61	153.95	307.56
214	6.10	0.00	0.00	6.10	0.00	0.41	2.50	0.21	0.00	0.59	3.60	0.79	0.00	2.50	3.60	1925.79	264.29	4818.64	951.62	5770.26	2.26	0.98	5.65	3.53	9.18
215	6.93	0.00	0.00	6.93	0.00	0.41	2.84	0.21	0.00	0.59	4.09	0.79	0.00	2.84	4.09	1925.79	264.29	5472.01	1080.65	6552.66	2.26	0.98	6.42	4.01	10.43
216	126.78	0.00	0.00	111.96	14.82	0.41	45.90	0.21	3.11	0.59	66.06	0.79	11.71	49.02	77.76	1925.79	264.29	94393.31	20551.85	114945.16	2.26	0.98	110.77	76.21	186.98
217	42.28	2.09	0.00	40.19	0.00	0.41	16.48	0.21	0.00	0.59	23.71	0.79	0.00	16.48	23.71	1925.79	264.29	31734.30	6267.13	38001.44	2.26	0.98	37.24	23.24	60.48
218	17.01	0.36	0.00	16.65	0.00	0.41	6.83	0.21	0.00	0.59	9.83	0.79	0.00	6.83	9.83	1925.79	264.29	13150.24	2597.01	15747.25	2.26	0.98	15.43	9.63	25.06
219	31.35	2.19	0.00	29.16	0.00	0.41	11.96	0.21	0.00	0.59	17.21	0.79	0.00	11.96	17.21	1925.79	264.29	23027.35	4547.62	27574.97	2.26	0.98	27.02	16.86	43.89
220	6.32	0.00	0.00	6.32	0.00	0.41	2.59	0.21	0.00	0.59	3.73	0.79	0.00	2.59	3.73	1925.79	264.29	4987.27	984.92	5972.20	2.26	0.98	5.85	3.65	9.50
221	287.10	4.18	0.00	282.92	0.00	0.41	116.00	0.21	0.00	0.59	166.92	0.79	0.00	116.00	166.92	1925.79	264.29	223382.54	44115.30	267497.84	2.26	0.98	262.15	163.58	425.73
222	3.16	0.00	0.00	3.16	0.00	0.41	1.30	0.21	0.00	0.59	1.87	0.79	0.00	1.30	1.87	1925.79	264.29	2496.04	492.94	2988.98	2.26	0.98	2.93	1.83	4.76
223	19.32	0.00	0.00	19.32	0.00	0.41	7.92	0.21	0.00	0.59	11.40	0.79	0.00	7.92	11.40	1925.79	264.29	15257.45	3013.16	18270.61	2.26	0.98	17.91	11.17	29.08
224	19.37	0.00	0.00	19.37	0.00	0.41	7.94	0.21	0.00	0.59	11.43	0.79	0.00	7.94	11.43	1925.79	264.29	15290.46	3019.68	18310.13	2.26	0.98	17.94	11.20	29.14
225	14.95	0.00	0.00	14.95	0.00	0.41	6.13	0.21	0.00	0.59	8.82	0.79	0.00	6.13	8.82	1925.79	264.29	11806.21	2331.58	14137.79	2.26	0.98	13.86	8.65	22.50
226	596.95	17.75	0.00	577.48	1.71	0.41	236.77	0.21	0.36	0.59	340.72	0.79	1.35	237.13	342.07	1925.79	264.29	456658.19	90405.04	547063.22	2.26	0.98	535.91	335.23	871.13
227	86.60	1.29	0.00	85.31	0.00	0.41	34.98	0.21	0.00	0.59	50.34	0.79	0.00	34.98	50.34	1925.79	264.29	67362.24	13303.21	80665.45	2.26	0.98	79.05	49.33	128.38
Totals	2455.45	63.39	0.00	2008.99	383.07		823.68		80.45		1185.30		302.63	904.13	1487.93			1741164.69	393244.95	2134409.64			2043.33	1458.17	3501.51
																Required Sediment Reduction (10%)				213440.96	Required Phosphorus Reduction (5%)				175.08

BMP Drainage Area Cover Calculations															BMP Sediment Load Calculations					BMP Phosphorus Load Calculations					
BMP-1	480.40	8.97	0.00	471.44	0.00	0.41	193.29	0.21	0.00	0.59	278.15	0.79	0.00	193.29	278.15	1925.79	264.29	372234.10	73511.64	445745.74	2.26	0.98	435.83	272.58	709.42

BMP-1 Pollutant Removal Calculations						
BMP ID	BMP Type	Sediment Load to BMP (lbs/yr)	Phosphorus Load to BMP (lbs/yr)	Sediment Removal Effectiveness	Phosphorus Removal Effectiveness	Phosphorus Removal (lbs/yr)
BMP-1	Wet Pond	445745.74	709.42	0.60	0.45	319.24

APPENDIX D-4 POLLUTANT REDUCTION PLAN CALCULATIONS																														
MS4 Municipality: Spring Township, Berks County										Permit No.: PAI 133503										GVC File No. 3011-413										
Local Watershed: Little Muddy Creek										Regional Watershed: Conestoga River - Susquehanna River - Chesapeake Bay										Date: July 24, 2017										
Stream Impairment: Sediment, Phosphorus and Nitrogen										UA IDs: Reading - 73,693 & Lancaster - 47,530																				
Existing Study Area Cover Calculations															Existing Sediment Load Calculations					Existing Phosphorus Load Calculations					Existing Nitrogen Load Calculations					
Outfall ID	Outfall Drainage Area (acres)	Paved Areas (acres)		UA Drainage Area (acres)	Non-UA Drainage Area (acres)	Impervious Area Factor (UA)	UA Impervious Area (acres)	Impervious Area Factor (Non-UA)	Non-UA Impervious Area (acres)	Pervious Area Factor (UA)	UA Pervious Area (acres)	Pervious Area Factor (Non-UA)	Non-UA Pervious Area (acres)	Total Impervious Area (acres)	Total Pervious Area (acre)	Impervious Area Sediment Load Factor (lbs/acre/yr)	Pervious Area Sediment Load Factor (lbs/acre/yr)	Impervious Area Sediment Load (lbs/yr)	Pervious Area Sediment Load (lbs/yr)	Total Outfall Sediment Load (lbs/yr)	Impervious Area Phosphorus Load Factor (lbs/acre/yr)	Pervious Area Phosphorus Load Factor (lbs/acre/yr)	Impervious Area Phosphorus Load (lbs/yr)	Pervious Area Phosphorus Load (lbs/yr)	Total Outfall Phosphorus Load (lbs/yr)	Impervious Area Nitrogen Load Factor (lbs/acre/yr)	Pervious Area Nitrogen Load Factor (lbs/acre/yr)	Impervious Area Nitrogen Load (lbs/yr)	Pervious Area Nitrogen Load (lbs/yr)	Total Outfall Nitrogen Load (lbs/yr)
		PennDOT	Other																											
401	94.89	0.00	0.00	73.13	21.76	0.41	29.98	0.21	4.57	0.59	43.15	0.79	17.19	34.55	60.34	1925.79	264.29	66543.88	15947.41	82491.29	2.26	0.98	78.09	59.13	137.23	36.81	34.02	1271.94	2052.79	3324.72
402	3.67	0.00	0.00	1.39	2.28	0.41	0.57	0.21	0.48	0.59	0.82	0.79	1.80	1.05	2.62	1925.79	264.29	2022.23	693.42	2715.64	2.26	0.98	2.37	2.57	4.94	36.81	34.02	38.65	89.26	127.91
403	45.37	18.00	0.00	24.30	3.07	0.41	9.96	0.21	0.65	0.59	14.34	0.79	2.43	10.61	16.77	1925.79	264.29	20432.30	4431.52	24863.82	2.26	0.98	23.98	16.43	40.41	36.81	34.02	390.55	570.44	960.98
404	0.36	0.00	0.00	0.08	0.27	0.41	0.03	0.21	0.06	0.59	0.05	0.79	0.22	0.09	0.27	1925.79	264.29	177.81	70.46	248.27	2.26	0.98	0.21	0.26	0.47	36.81	34.02	3.40	9.07	12.47
405	21.17	4.58	0.00	4.03	12.56	0.41	1.65	0.21	2.64	0.59	2.38	0.79	9.92	4.29	12.30	1925.79	264.29	8264.37	3251.51	11515.88	2.26	0.98	9.70	12.06	21.76	36.81	34.02	157.97	418.54	576.51
406	39.55	0.00	0.00	3.67	35.88	0.41	1.50	0.21	7.53	0.59	2.16	0.79	28.35	9.04	30.51	1925.79	264.29	17407.34	8063.45	25470.79	2.26	0.98	20.43	29.90	50.33	36.81	34.02	332.73	1037.95	1370.67
Totals	205.03	22.58	0.00	106.61	75.83		43.71		15.93		62.90		59.91	59.64	122.81			114847.93	32457.77	147305.70			134.78	126.35	255.13			2195.23	4178.04	6373.27
																Required Sediment Reduction (10%)				34730.57	Required Phosphorus Reduction (5%)				12.76	Required Nitrogen Reduction (3%)				191.20

BMP-1 Pollutant Removal Calculations									
BMP ID	BMP Type	Sediment Load to BMP (lbs/yr)	Phosphorus Load to BMP (lbs/yr)	Nitrogen Load to BMP (lbs/yr)	Sediment Removal Effectiveness	Phosphorus Removal Effectiveness	Nitrogen Removal Effectiveness	Sediment Removal (lbs/yr)	Phosphorus Removal (lbs/yr)
BMP-1	Dry Extended Detention Basin	82491.29	137.23	3324.72	0.60	0.20	0.20	49494.77	27.45

## **SECTION E**

### **Proposed Pollutant Removal BMPs**

While the municipal MS4 drains to four (4), separate, impaired watersheds subject to PRP requirements, per the "Pollutant Aggregation Suggestions for MS4 Requirements Table," the Township is permitted to collectively address the required pollutant reductions associated with the Tulpehocken Creek and the Cacoosing. However, it is required that the required pollutant reductions associated with the Little Muddy Creek be addressed separately. Accordingly, the Township has chosen to propose two (2) BMPs to address the required pollutant load reductions. One (1) facility will be located within Cacoosing Creek watershed to satisfy the required pollutant reductions associated with both the Cacoosing Creek and Tulpehocken Creek. Additionally, one (1) facility will be located within the Little Muddy Creek watershed to satisfy the required pollutant reductions associated with the Little Muddy Creek. The facility (BMP-1) within the Cacoosing Creek watershed will be located and sized to not only address the required pollutant reductions associated with the Cacoosing Creek, but also to compensate for the required pollutant reductions associated with the MS4 drainage areas that drain directly to the Tulpehocken Creek.

The proposed pollutant removal BMPs consist of two (2) different types: a wet pond and a dry extended detention basin. Proposed BMP-1 is a wet pond. A wet pond is a water impoundment structure that intercepts stormwater runoff then releases it to an open water system at a specified flow rate. A wet pond retains a permanent pool and usually has a retention time sufficient to allow settlement of some portion of the intercepted sediments and attached nutrients/toxics. There is little or no vegetation living within the pooled area nor are outfalls directed through vegetated areas prior to open water release. Proposed BMP-2 is a dry extended detention basin. A dry extended detention basin is a depression created by excavation or berm construction that temporarily stores runoff and releases it slowly via surface flow or groundwater infiltration following storms. Dry extended detention basins are designed to dry out between storm events, in contrast with wet ponds, which contain standing water permanently. As such, they are similar in construction and function to dry detention basins, except that the duration of detention of stormwater is designed to be longer, theoretically improving treatment effectiveness.

As noted above, the required sediment, phosphorus and nitrogen (as applicable) pollutant load removals were calculated by multiplying the existing sediment, phosphorus and nitrogen (as applicable) pollutant loads by factors of 0.10, 0.05 and 0.03, respectively. Projected pollutant loads to the proposed BMPs were calculated based the amounts of impervious and pervious coverages within the BMP drainage areas using the pollutant load factors for Berks County, as outlined in "Attachment B" of the PRP instructions. Upon evaluating the actual amounts of impervious and pervious coverages within the BMP drainage areas, it was determined that the impervious coverage percentages of 41% for urbanized areas, and 21% for non-urbanized areas, provided in the "Statewide MS4 Land Cover Estimates" document are reasonably consistent with the actual calculated coverages within the BMP drainage areas. BMP drainage area pollutant load calculations have been provided in Appendix D-3 and Appendix D-4. Additionally, summary tables of the BMP drainage area pollutant load calculations have been provided on sheets 3011-413-D-008 & 009 of the mapping plan set.

Projected BMP pollutant removal loads have been calculated by multiplying the sediment, phosphorus and nitrogen (as applicable) loads associated with the BMP drainage areas by the

applicable BMP effectiveness values as provided in the "BMP Effectiveness Values" document (see Appendix E-1). BMP pollutant removal load calculations have been provided in Appendix D-3 and Appendix D-4. Additionally, summary tables of the BMP pollutant removal load calculations have been provided on sheets 3011-413-D-008 & 009 of the mapping plan set.

Construction of the proposed BMPs will be completed within five (5) years of the effective date of the renewed MS4 Permit. The anticipated effective date of the renewed permit is Spring of 2018. Final design details for the BMPs will be provided to DEP with the required progress reports during the 2018-2023 permit cycle.

# **SECTION E – Appendices**

Appendix E-1 – BMP Effectiveness Values

Appendix E-2 – Pollutant Aggregation Suggestions for  
MS4 Requirements Table Excerpt



## APPENDIX E-1

### NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) STORMWATER DISCHARGES FROM SMALL MUNICIPAL SEPARATE STORM SEWER SYSTEMS BMP EFFECTIVENESS VALUES

This table of BMP effectiveness values (i.e., pollutant removal efficiencies) is intended for use by MS4s that are developing and implementing Pollutant Reduction Plans and TMDL Plans to comply with NPDES permit requirements. The values used in this table generally consider pollutant reductions from both overland flow and reduced downstream erosion, and are based primarily on average values within the Chesapeake Assessment Scenario Tool (CAST) ([www.castool.org](http://www.castool.org)). Design considerations, operation and maintenance, and construction sequences should be as outlined in the Pennsylvania Stormwater BMP Manual, Chesapeake Bay Program guidance, or other technical sources. The Department of Environmental Protection (DEP) will update the information contained in this table as new information becomes available. Interested parties may submit information to DEP for consideration in updating this table to DEP's MS4 resource account, [RA-EPPAMS4@pa.gov](mailto:RA-EPPAMS4@pa.gov). Where an MS4 proposes a BMP not identified in this document or in Chesapeake Bay Program expert panel reports, other technical resources may be consulted for BMP effectiveness values. Note – TN = Total Nitrogen and TP = Total Phosphorus.

BMP Name	BMP Effectiveness Values			BMP Description
	TN	TP	Sediment	
Wet Ponds and Wetlands	20%	45%	60%	A water impoundment structure that intercepts stormwater runoff then releases it to an open water system at a specified flow rate. These structures retain a permanent pool and usually have retention times sufficient to allow settlement of some portion of the intercepted sediments and attached nutrients/toxics. Until recently, these practices were designed specifically to meet water quantity, not water quality objectives. There is little or no vegetation living within the pooled area nor are outfalls directed through vegetated areas prior to open water release. Nitrogen reduction is minimal.
Dry Detention Basins and Hydrodynamic Structures	5%	10%	10%	Dry Detention Ponds are depressions or basins created by excavation or berm construction that temporarily store runoff and release it slowly via surface flow or groundwater infiltration following storms. Hydrodynamic Structures are devices designed to improve quality of stormwater using features such as swirl concentrators, grit chambers, oil barriers, baffles, micropools, and absorbent pads that are designed to remove sediments, nutrients, metals, organic chemicals, or oil and grease from urban runoff.
Dry Extended Detention Basins	20%	20%	60%	Dry extended detention (ED) basins are depressions created by excavation or berm construction that temporarily store runoff and release it slowly via surface flow or groundwater infiltration following storms. Dry ED basins are designed to dry out between storm events, in contrast with wet ponds, which contain standing water permanently. As such, they are similar in construction and function to dry detention basins, except that the duration of detention of stormwater is designed to be longer, theoretically improving treatment effectiveness.

## APPENDIX E-2

MS4 Name	Permit Number	HUC 12 Name	Impaired Downstream Waters or Applicable TMDL Name	Requirement(s)
<b>Berks County</b>				
RUSCOMBANOR TWP	PAG133668	Willow Creek	Willow Creek	Appendix E-Nutrients, Siltation
		Laurel Run-Schuylkill River	Schuylkill River	Appendix C-PCB
		Lower Maiden Creek, Willow Creek	Maiden Creek, Willow Creek	Appendix B-Pathogens
SHILLINGTON BORO	PAI133502	Angelica Creek-Schuylkill River, Wyomissing Creek	Wyomissing Creek TMDL	TMDL Plan-Siltation
		Angelica Creek-Schuylkill River	Schuylkill River PCB TMDL	Appendix C-PCB
SHOEMAKERSVILLE BORO		Pigeon Creek-Schuylkill River	Unnamed Tributaries to Schuylkill River	Appendix E-Siltation
		Laurel Run-Schuylkill River, Pigeon Creek-Schuylkill River	Schuylkill River PCB TMDL	Appendix C-PCB
SINKING SPRING BORO	PAG133509	Cacoosing Creek	Cacoosing Creek	Appendix B-Pathogens
		Cacoosing Creek, Lower Tulpehocken Creek	Cacoosing Creek, Tulpehocken Creek	Appendix E-Nutrients, Siltation
		Angelica Creek-Schuylkill River	Schuylkill River	Appendix C-PCB
SOUTH HEIDELBERG TWP	PAG133709	Cacoosing Creek, Middle Tulpehocken Creek, Spring Creek	Blue Marsh Lake, Cacoosing Creek	Appendix B-Pathogens
		Little Muddy Creek	Chesapeake Bay Nutrients/Sediment	Appendix D-Siltation/Nutrients
		Little Cocalico Creek-Cocalico Creek	Chesapeake Bay Nutrients/Sediment, Cocalico Creek	Appendix D-Siltation/Nutrients, Appendix E-Nutrients, Organic Enrichment/Low D.O., Siltation
		Angelica Creek-Schuylkill River	Schuylkill River	Appendix C-PCB
		Cacoosing Creek, Lower Tulpehocken Creek, Middle Tulpehocken Creek, Spring Creek	Blue Marsh Lake, Cacoosing Creek, Little Cacoosing Creek, Manor Creek, Spring Creek, Tulpehocken Creek	Appendix E-Nutrients, Organic Enrichment/Low D.O., Siltation
SPRING TWP	PAI133503	Muddy Creek	Little Muddy Creek	Appendix E-Nutrients, Siltation
		Little Muddy Creek, Muddy Creek	Chesapeake Bay Nutrients/Sediment, Little Muddy Creek	Appendix D-Siltation/Nutrients, Appendix E-Nutrients, Siltation
		Little Cocalico Creek-Cocalico Creek	Chesapeake Bay Nutrients/Sediment, Cocalico Creek	Appendix D-Siltation/Nutrients, Appendix E-Nutrients, Siltation
		Angelica Creek-Schuylkill River, Wyomissing Creek	Wyomissing Creek TMDL	TMDL Plan-Siltation
		Angelica Creek-Schuylkill River	Schuylkill River	Appendix C-PCB
		Cacoosing Creek	Cacoosing Creek	Appendix B-Pathogens
		Cacoosing Creek, Lower Tulpehocken Creek	Cacoosing Creek, Tulpehocken Creek	Appendix E-Nutrients, Siltation
ST LAWRENCE BORO	PAG133508	Angelica Creek-Schuylkill River, Sixpenny Creek-Schuylkill River	Schuylkill River PCB TMDL	Appendix C-PCB
		Angelica Creek-Schuylkill River, Antietam Creek	Antietam Creek	Appendix B-Pathogens
TILDEN TWP		Hassler Run-Mill Creek	Hassler Run, Mill Creek	Appendix B-Pathogens
		Pigeon Creek-Schuylkill River	Schuylkill River	Appendix C-PCB
TOPTON BORO		Liebert Creek-Little Lehigh Creek	Little Lehigh Creek, Unnamed Tributaries to Little Lehigh Creek	Appendix B-Pathogens, Appendix E-Organic Enrichment/Low D.O., Siltation

# **SECTION F**

## **Anticipated Costs & Funding Mechanisms**

The anticipated total cost of the proposed PRP BMPs is \$623,500. The Township intends to fund the proposed improvements with a combination of general funds and low interest municipal loans (e.g. PennVEST). Other potential funding sources include various grants (i.e. Growing Greener) that may be available or become available during the permit cycle.

A cost estimate is included in Appendix F-1.

# **SECTION F – Appendices**

## **Appendix F-1 – BMP Cost Estimate**

## APPENDIX F-1

PROJECT: SPRING TOWNSHIP POLLUTANT REDUCTION PLAN					
TITLE: PRP BMP COST ESTIMATE - BMP-1 & BMP-2					
DATE: 7-24-17					
ITEM NO.	DESCRIPTION	UNITS	TOTAL PLAN UNITS	ESTIMATED UNIT PRICE	CONTRACT AMOUNT
<b>I.</b>	<b>BMP-1</b>				
	<b>A. DESIGN ENGINEERING &amp; PERMITTING</b>	LS	1.00	\$40,000.00	<b>\$40,000.00</b>
	<b>B. MOBILIZATION &amp; DEMOBILIZATION</b>	LS	1.00	\$10,000.00	<b>\$10,000.00</b>
	<b>C. CONSTRUCTION</b>				
1.	CLEAR & GRUB	LS	1.00	\$1,500.00	\$1,500.00
2.	EROSION AND SEDIMENT CONTROLS	LS	1.00	\$15,000.00	\$15,000.00
3.	STRIP TOPSOIL	SY	15000.00	\$3.00	\$45,000.00
4.	BULK EXCAVATION	CY	15000.00	\$3.50	\$52,500.00
5.	PLANTING SOIL	CY	500.00	\$40.00	\$20,000.00
6.	FINE GRADING	SY	15000.00	\$2.00	\$30,000.00
7.	RESPREAD TOPSOIL	SY	14000.00	\$3.50	\$49,000.00
8.	ROCK WATERLINE PROTECTION	TONS	1650.00	\$25.00	\$41,250.00
9.	OUTLET STRUCTURE	LS	1.00	\$2,000.00	\$2,000.00
10.	SEEDING AND LANDSCAPING	LS	1.00	\$20,000.00	\$20,000.00
	<b>SUBTOTAL OF ITEM D.</b>				<b>\$276,250.00</b>
	<b>D. CONSTRUCTION PHASE ENGINEERING</b>	LS	1.00	\$15,000.00	<b>\$15,000.00</b>
	<b>BMP-1 ESTIMATE SUBTOTAL</b>				<b>\$341,250.00</b>
<b>II.</b>	<b>BMP-2</b>				
	<b>A. DESIGN ENGINEERING &amp; PERMITTING</b>	LS	1.00	\$35,000.00	<b>\$35,000.00</b>
	<b>B. MOBILIZATION &amp; DEMOBILIZATION</b>	LS	1.00	\$10,000.00	<b>\$10,000.00</b>
	<b>C. CONSTRUCTION</b>				
1.	CLEAR & GRUB	LS	1.00	\$1,500.00	\$1,500.00
2.	EROSION AND SEDIMENT CONTROLS	LS	1.00	\$12,500.00	\$12,500.00
3.	STRIP TOPSOIL	SY	13500.00	\$3.00	\$40,500.00
4.	BULK EXCAVATION	CY	18000.00	\$3.50	\$63,000.00
5.	PLANTING SOIL	CY	500.00	\$40.00	\$20,000.00
6.	FINE GRADING	SY	13500.00	\$2.00	\$27,000.00
7.	RESPREAD TOPSOIL	SY	12500.00	\$3.50	\$43,750.00
8.	OUTLET STRUCTURE W/OUTLET PIPE	LS	1.00	\$5,000.00	\$5,000.00
9.	SEEDING AND LANDSCAPING	LS	1.00	\$12,000.00	\$12,000.00
	<b>SUBTOTAL OF ITEM D.</b>				<b>\$225,250.00</b>
	<b>D. CONSTRUCTION PHASE ENGINEERING</b>	LS	1.00	\$12,000.00	<b>\$12,000.00</b>
	<b>BMP-2 ESTIMATE SUBTOTAL</b>				<b>\$282,250.00</b>
	<b>ESTIMATE GRAND TOTAL</b>				<b>\$623,500.00</b>

## **SECTION G**

### **Responsible Parties for BMP Operations & Maintenance (O&M)**



### BMP-1

The Township will be responsible for the operations and maintenance of BMP-1. As noted previously in this narrative, the proposed BMP is a wet pond. The following is a list of procedures that will be implemented for the operations and maintenance associated with the BMP:

- Within the first year following construction of the facility, conduct periodic inspections of the facility at least once every two (2) months and after every storm event that produces 1" or more of rain.
- After the first year following construction of the facility, conduct periodic inspections of the facility at least four (4) times per year and after every storm event that produces 2" or more of rain.
- Periodic inspections shall include the following steps:
  - Inspect the vegetation to evaluate the health of all grasses and plantings in the vicinity of the facility. Determine if any of the required plantings are dead or in poor health and need to be replaced. Determine if any threatening or invasive species are growing within, or in close proximity to the facility.
  - Determine if any erosive conditions exist, within or immediately downstream of the facility, which need to be remediated. Particular attention should be given to both the inlet end and outlet end of the facilities.
  - Monitor amount of sediment that has accumulated in the sediment forebay and determine if any excess sediment has accumulated elsewhere within the facility.
  - Determine if any litter, garbage or other deleterious material has been collected by the facility. Particular attention should be given to the trash rack and outlet structure.
  - Inspect drain to ensure functionality.
- Conduct routine maintenance as dictated by findings of the periodic inspections, and as follows:
  - Any dead plantings, or plantings in poor health, shall be replaced with healthy plantings of the same species as soon as reasonably practical. Any threatening or invasive species that may be discovered should be immediately removed from the facility.
  - Any areas compromised by erosion should be immediately remediated to the conditions that existed prior to the erosion. If erosive conditions persist after remediation, the issue shall be immediately reported to the Township Engineer to develop a satisfactory, permanent solution.

- Any sediment deposits exceeding depths of six inches (6") within the sediment forebay, shall be immediately removed from the facility. The sediment shall be removed as carefully as practical as to cause minimal damage to the facility vegetation. Sediment removal should be conducted when the forebay is completely dry. Sediment should be disposed of properly and once sediment is removed, disturbed areas need to be immediately stabilized and revegetated.
- Any litter, garbage or other deleterious material that may be discovered in the facility shall be removed and immediately disposed of.
- Areas immediately adjacent to the facility shall be appropriately mowed and/or maintained as to mitigate the potential for the migration of invasive species into the facility.
- In the event that the drain is clogged or not functioning properly, the drain shall immediately be unclogged or repaired to restore functionality.
- All periodic inspections and all maintenance activities shall be documented by written inspection and maintenance reports. The reports shall provide the dates and descriptions of the inspection and maintenance activities along with the names of the individuals responsible for conducting these activities.

## BMP-2

The Township will be responsible for the operations and maintenance of BMP-2. As noted previously in this narrative, the proposed BMP is a dry extended detention basin. The following is a list of procedures that will be implemented for the operations and maintenance associated with the BMP:

- Within the first year following construction of the facility, conduct periodic inspections of the facility at least once every two (2) months and after every storm event that produces 1" or more of rain.
- After the first year following construction of the facility, conduct periodic inspections of the facility at least four (4) times per year and after every storm event that produces 2" or more of rain.
- Periodic inspections shall include the following steps:
  - Inspect the vegetation to evaluate the health of all grasses and plantings. Determine if any of the required plantings are dead or in poor health and need to be replaced. Determine if any threatening or invasive species are growing within, or in close proximity to the facility.
  - Determine if any erosive conditions exist, within or immediately downstream of the facility, which need to be remediated. Particular attention should be given to both the inlet end and outlet end of the facilities.

- Monitor amount of sediment that has accumulated in the sediment forebay and determine if any excess sediment has accumulated elsewhere within the facility.
- Determine if any litter, garbage or other deleterious material has been collected by the facility. Particular attention should be given to the trash rack and outlet structure.
- Monitor vegetative cover within the facility.
- Conduct routine maintenance as dictated by findings of the periodic inspections, and as follows:
  - Any dead plantings, or plantings in poor health, shall be replaced with healthy plantings of the same species as soon as reasonably practical. Any threatening or invasive species that may be discovered should be immediately removed from the facility.
  - Any areas compromised by erosion should be immediately remediated to the conditions that existed prior to the erosion. If erosive conditions persist after remediation, the Township shall report the issue to the Township Engineer to develop a satisfactory, permanent solution.
  - Any sediment deposits exceeding depths of six inches (6") within the sediment forebay, or exceed three inches (3") elsewhere, shall be immediately removed from the facility. The sediment shall be removed as carefully as practical as to cause minimal damage to the facility vegetation. Sediment removal should be conducted when the basin is completely dry. Sediment should be disposed of properly and once sediment is removed, disturbed areas need to be immediately stabilized and revegetated.
  - Any litter, garbage or other deleterious material that may be discovered in the facility shall be removed and immediately disposed of.
  - Areas immediately adjacent to the facility shall be appropriately mowed and/or maintained as to mitigate the potential for the migration of invasive species into the facility.
  - Vegetative cover should be maintained at a minimum of 95%. If vegetative cover has been reduced by 10%, vegetation should be reestablished.
- All periodic inspections and all maintenance activities shall be documented by written inspection and maintenance reports. The reports shall provide the dates and descriptions of the inspection and maintenance activities along with the names of the individuals responsible for conducting these activities.

Once the proposed BMPs are constructed, the Township will be responsible for revising the MS4 O&M Manual to address the O&M responsibilities associated with the PRP BMPs. Any future

revisions to the O&M Manual will need to be reported in the required periodic report associated with the reporting period in which the revisions were made.